WHAT IS CLAIMED IS:

1. An apparatus for measuring the refractive index of a substance, said apparatus comprising:

a first lens;

a second lens disposed opposite to the first lens along an optical axis;

a gap between the first and second lenses, the gap adapted to receive the substance;

a beam profiler disposed to receive light passed from the first lens through the gap and the second lens, and to measure a beam width of the received light; and

a controller that estimates the refractive index of the substance from a measured beam width and a relationship between refractive index and beam width.

2. The apparatus of claim 1, wherein light exiting the second lens has a converging section and a diverging section, the converging section being closer to the second lens than the diverging section, and wherein the beam profiler has an optical capture window that is positioned in the diverging section.

3. The apparatus of Claim 1 further comprising a substrate, and

wherein the first lens comprises a planar spreading lens disposed on the substrate, the planar spreading lens having a first surface for receiving light and a second surface opposite to the first surface; and

wherein the second lens comprises a planar converging lens disposed on the substrate, the planar converging lens having a first surface facing the second surface of the planar spreading lens and a second surface opposite to the first surface.

4. The apparatus of Claim 3 further comprising a waveguide disposed on the substrate to couple light to the first surface of the planar spreading lens.

5. The apparatus of Claim 3 further comprising a recess formed in the substrate, a first portion of the recess being disposed adjacent to the gap and a second portion being disposed under at least a portion of the gap.

6. The apparatus of Claim 3 further comprising a fixture having a first retainer for holding the substrate and a second retainer for attaching to an optical capture element of the beam profiler.

7. The apparatus of Claim 3 wherein the optical axis passes through the planar spreading lens and the planar converging lens, wherein the second surface of the planar spreading lens has a curvature that follows the contour of an ellipse, the ellipse having a first axis (P_S) that is parallel to the optical axis and a second axis (T_S) that is transverse to the optical axis.

8. The apparatus of Claim 7 wherein the first axis is longer than the second axis.

9. The apparatus of Claim 3 wherein the optical axis passes through the planar spreading lens and the planar converging lens, wherein the first surface of the planar converging lens has a curvature that follows the contour of an ellipse, the ellipse having a first axis (P_C) that is parallel to the optical axis and a second axis (T_C) that is transverse to the optical axis.

10. The apparatus of Claim 9 wherein the first axis is longer than the second axis.

11. The apparatus of Claim 3 further comprising a heater element disposed on at least one of the planar lenses, and a temperature sensor.

12. The apparatus of Claim 3 further comprising a heater element disposed in the gap, and a temperature sensor.

13. The apparatus of Claim 3 further comprising a first electrode and a second electrode positioned to generate an electric field that passes through at least the gap.

14. The apparatus of Claim 3 further comprising a coil that generates a magnetic field that passes through at least the gap.

15. The apparatus of Claim 1 further comprising a first capillary guide disposed at an edge of the first lens, and a second capillary guide disposed at an edge of the second lens, the first and second capillary guides providing an opening for the substance which is wider than a distance between the first and second lenses.

16. The apparatus of Claim 1 further comprising a source of heat and a temperature sensor.

17. An assembly for holding a substance whose refractive index is to be measured, said assembly comprising:

a substrate having a top surface, a first side and a second side;

a first planar lens disposed on the top surface of the substrate, the first planar lens having a first surface for receiving light and a second surface opposite to the first surface;

a second planar lens disposed on the top surface of the substrate and located opposite to the first planar lens along an optical axis, the second planar lens having a first surface facing the second surface of the first planar lens and a second surface opposite to the first surface;

a gap between the first and second planar lenses, the gap adapted to receive the substance; and

an area on the top surface of the substrate that is located between the second lens and the second side of the substrate and that is free of obstructions to at least one wavelength of light.

18. The assembly of claim 17 further comprising a waveguide disposed on the substrate to couple light to the first surface of the first planar lens.

19. The assembly of claim 17 further comprising a recess formed in the substrate, a first portion of the recess being disposed adjacent to the gap and a second portion being disposed under at least a portion of the gap.

20. The assembly of Claim 17 further comprising a first capillary guide disposed at an edge of the first planar lens, and a second capillary guide disposed at an edge of the second planar

lens, the first and second capillary guides providing an opening for the substance which is wider than a distance between the first and second planar lenses.

21. The assembly of Claim 17 wherein the second surface of the first planar lens has a curvature that follows the contour of an ellipse, the ellipse having a first axis (P_S) that is parallel to the optical axis and a second axis (T_S) that is transverse to the optical axis.

22. The assembly of Claim 21 wherein the first axis is longer than the second axis.

23. The assembly of Claim 17 wherein the first surface of the second planar lens has a curvature that follows the contour of an ellipse, the ellipse having a first axis (P_C) that is parallel to the optical axis and a second axis (T_C) that is transverse to the optical axis.

24. The assembly of Claim 23 wherein the first axis is longer than the second axis.

25. The assembly of Claim 17 further comprising a heater element disposed on at least one of the planar lenses.

26. The assembly of Claim 17 further comprising a heater element disposed in the gap, and a temperature sensor.

27. A method for measuring the refractive index of a substance, comprising the steps of:

(a) disposing the substance between a first lens and a second lens;

(b) passing light from the first lens to the second lens through the substance;

(c) measuring the beam width of the light exiting the second lens; and

(d) estimating the refractive index of the substance from the measured beam width and a relationship between refractive index and beam width.

28. The method of claim 27 wherein and the substance is in liquid form.

29. The method of claim 27 wherein step (a) comprises the steps of disposing the substance in liquid form between the lenses, and thereafter converting the substance to a solid form.

30. The method of claim 27 further comprising of the step of heating the substance during steps (b) and (c) to one or more temperatures above room temperature.

31. The method of claim 27 further comprising of the step of cooling the substance during steps (b) and (c).

32. The method of claim 27 further comprising of the step of applying an electric field to the substance during steps (b) and (c).

33. The method of claim 27 further comprising of the step of applying a magnetic field to the substance during steps (b) and (c).

34. The method of claim 27 for the comprising the step of varying the wavelength of the light during steps (b) and (c).

35. The method of claim 27 wherein the first lens comprises a planar spreading lens formed on a substrate, and wherein the second lens comprises a planar converging lens formed on said substrate.

36. The method of claim 27, wherein the light exiting the second lens has a converging section and a diverging section, the converging section being closer to the second lens than the diverging section, and wherein step (c) comprises measuring the beam width of the exiting light in the diverging section.

37. An assembly for holding a sample whose refractive index is to be measured, said assembly comprising:

a substrate having a top surface, a first side and a second side;

a first planar lens disposed on the top surface of the substrate, the first planar lens having a first surface for receiving light and a second surface opposite to the first surface;

a second planar lens disposed on the top surface of the substrate and located opposite to the first planar lens, the second planar lens having a first surface facing the second surface of the first planar lens and a second surface opposite to the first surface;

a gap between the first and second planar lenses, the gap adapted to receive the sample; and

an area on the top surface of the substrate that is located between the second lens and the second side of the substrate and that is free of obstructions to at least one wavelength of light.

38. The assembly of claim 37 wherein the first and second planar lenses are disposed on a common optical axis along which light propagates from the first planar lens to the second planar lens, wherein the first surface of the second planar lens is substantially flat and substantially perpendicular to the optical axis, and wherein the assembly further comprising an alignment guide disposed in the gap, the alignment guide being at an angle with respect to the first surface of the second planar lens.

39. The assembly of Claim 37 wherein the first and second planar lenses are disposed on a common optical axis along which light propagates from the first planar lens to the second planar lens, wherein the first surface of the second planar lens is substantially flat and tilted such that the normal vector of the first surface forms an angle with respect the optical axis, the angle being greater than zero degrees and less than or equal to 45-degrees.

40. The assembly of Claim 37 wherein the angle is less than or equal to 15-degrees.

41. The assembly of Claim 37 wherein the first planar lens has a first optical axis along which light propagates from the first surface of the first planar lens to the second surface of the first planar lens;

wherein the second planar lens has a second optical axis along which light propagates from the first surface of the second planar lens to the second surface of the second planar lens; and

wherein the first optical axis is set at an angle to the second optical axis, the angle being greater than zero and less than 45-degrees.

42. An assembly for holding a material in a measurement of an optical transmission property of the material, said assembly comprising:

a substrate having a top surface;

a first planar lens disposed on the top surface of the substrate, the first planar lens having a first surface for receiving light and a second surface opposite to the first surface;

a second planar lens disposed on the top surface of the substrate and located opposite to the first planar lens, the second planar lens having a first surface facing the second surface of the first planar lens and a second surface opposite to the first surface, the first and second planar lenses being disposed on a first optical axis along which light propagates from the first planar lens to the second planar lens;

a first gap between the first and second planar lenses having a first spacing distance between the first and second planar lenses, the gap adapted to receive a first body of material;

a third planar lens disposed on the top surface of the substrate, the third planar lens having a first surface for receiving light and a second surface opposite to its first surface;

a fourth planar lens disposed on the top surface of the substrate and located opposite to the third planar lens, the fourth planar lens having a first surface facing the second surface of third planar lens and a second surface opposite to its first surface, the third and fourth planar lenses being disposed on a second optical axis along which light propagates from the third planar lens to the fourth planar lens; and

a second gap between the third and fourth planar lenses having a second spacing distance between the third and fourth planar lenses, the second gap adapted to receive a

second body of material, the second spacing distance being different from the first spacing distance.

43. An optical apparatus comprising:

a substrate;

an optical device disposed on the substrate and having a first body of an electro-optic material and an electrode for receiving a control signal;

a controller having a first input for receiving an electrical input and a first output coupled to the electrode of the optical device;

a first planar lens disposed on the top surface of the substrate, the first planar lens having a first surface for receiving light and a second surface opposite to the first surface;

a second planar lens disposed on the top surface of the substrate and located opposite to the first planar lens, the second planar lens having a first surface facing the second surface of the first planar lens and a second surface opposite to the first surface;

a gap between the first and second planar lenses;

a second body of the electro-optic material disposed between the first and second planar lenses;

a source of light coupled to the first lens; and

a beam profiler disposed to receive light passed from the first lens through the second body of the electro-optic material and the second lens, and to generate an output signal representative of a characteristic of the received light; and

wherein the controller further comprises a second input coupled to the output of the beam profiler, and wherein the controller adjusts the signal at its first output in response to the signal received at its second input.

44. The apparatus of Claim 43 wherein the characteristic is the deflection angle of the light relative to an axis or the beam width of the light.

45. The apparatus of Claim 43 wherein an electrode is disposed over the second body of electro-optic material, and wherein the controller has a second output coupled to the electrode disposed over the second body of electro-optic material.